

agement for an operation, one of the most severe of surgery, which still wants general recognition; yet we certainly expected more from countrymen of Pean and Urdy, whose achievements and success in this operation have been equal to the best, and have everywhere won for their names honoured recognition. In the medical treatment of uterine fibroids we find nothing new. So far as the experience of the authors go, it is favourable to Hildebrandt's plan of hypodermic injections of ergot, but they have no brilliant results to report.

We close our examination of this work fearing that the patience of our readers has been long since exhausted. Our object has been to give them an opportunity of judging for themselves, both as to its positive and comparative merits. With this view we have made numerous extracts, and we have chosen as subjects some diseases falling daily under observation, and some of the rarest and most severe. The book is a good one, certainly so in a clinical point of view; some parts of it are excellent, as, for instance, that relating to fibrous tumours and the complication of pregnancy and labour by them. It is marked throughout by great conservatism as to surgical measures of treatment of uterine diseases, a characteristic which will enhance its value in the eyes of some, depreciate it in the opinion of others.

We had marked several other extracts illustrative of this feature of the work, which time will not permit us to give; notably one as to intra-uterine pessaries, which originated, we are told, at a time "*when no one doubted the possibility of curing a majority of the diseases of the uterus!*" The whole tone of the work is decidedly anti-surgical:—

"In measure as our knowledge of uterine disease increases and enlarges, the rôle of surgery, although still remaining important, becomes less active and less venturesome."

While according this latest production of the French capital great praise, we cannot but express surprise to find that there are omissions of measures of diagnosis and treatment, some of which we have noted, which are counted within the resources of, and used by, practitioners in even second-rate towns in our own country.

It is gratifying to note the frequent reference to our authorities, and we have met with no European work to compare with this one in this respect. Drs. Thomas and Sims are both quoted frequently throughout the work, the former at length on the treatment of acute metritis, the latter on the enucleation of fibroids; and we find the names of Atlee, Peaslee, Emmet, Burnham, Kimbal, Parvin, Reeves Jackson, Engelman, and others.

J. C. R.

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ART. XXVI.—*The Germ Theory applied to the Explanation of Disease; the Specific Fevers.* By T. MACLAGAN, M.D. 8vo. pp. 278. London: MacMillan & Co., 1876.

THIS work has been, and will be, severely criticized, not only by those who differ from its author in opinion, but also by others, who condemn it because, without adding new facts to science, it is concerned merely with reasoning upon those already known, in order to obtain conclusions upon

an important subject. Against this last ground of criticism we deem it not untimely to protest. The true thinker must always take higher rank in the heraldry of science than the mere observer. Facts before known made the basis of those grand generalizations by which Kepler, Newton, Lavoisier, Dalton, Harvey, and Jenner astonished and benefited the world. So far as those great men also added to science facts of their own discovery, this was another, but a lesser, occasion of glory to their names.

Dr. MacLagan's subject is certainly one worthy of very careful and laborious attention. Hitherto, as he remarks, it has been treated chiefly as a biological topic. More attention has been paid to the mode of origin than to the mode of action of the germs supposed to exist. Considering it rather as a pathological question, the purpose of the book before us is to investigate, not whether germs may originate *de novo*, but *whether the propagation of germs in the system is competent to produce the phenomena of disease*. The author deals, in the present volume, with the specific fevers; excluding from this category all forms of fever which are not regarded as due to the entrance into the system from without of a specific *materies morbi*. At the outset, we may observe that *malarial* fevers, remittent and intermittent, are, by almost all those who have reasoned upon them, considered to be due to the entrance of a morbid cause from without into the system. By implication at least, on two occasions, our author admits (pp. 78 and 87) the claim of intermittent fever to obtain inclusion in his list of "specific fevers." Yet malarial fevers are not directly treated of in the book. Two great groups of specific fevers are named: those characterized by a local lesion, and those having no such characteristic. The former he refers to as the eruptive, and the latter as the non-eruptive specific fevers. The types of the first group are variola, varicella, measles, scarlatina, typhus, typhoid, and cerebro-spinal fever. The type of the non-eruptive group is relapsing fever.

*Zymotic*, the old word (at least since Liebig's time) for all these disorders, is a term ignored by our author. "Certain it is," he says, "that our knowledge of the mode of production of fermentative and putrefactive changes is not sufficiently precise to be used as a stand-point from which diseased processes may be studied." Such a rejection of the idea of morbid *zymosis* has now become quite general. We believe, however, that the reaction from a tendency, once existing, to *overstrain* the analogy, dwelt upon so earnestly by the great German chemist, has led many to underestimate the actual value of that analogy. It was never a *resemblance* of physical *appearances*, but a *parallelism* of causative *relations* that Liebig urged; and this parallelism, between the action of a ferment upon a vegetable juice, and that of a virus upon the fluids of a human body, does exist.

Taking it as granted that "the distinguishing characteristic of those maladies which are believed to result from the action of germs is contagion," Dr. MacLagan defines a *contagium* as "a morbid agent propagated in, and given off from the bodies of the sick, and capable of producing in another body a disease similar to that during whose course it was formed." Confession is made of the imperfection of our knowledge of the nature of contagion. The two most promising modes of investigation of it are—the examination of fluids known to manifest it, and a consideration of the facts of infection.

In the case of two diseases, relapsing fever and splenic fever, foreign organisms are asserted to have been detected in the blood. From the

observations of Beale, Chauveau, and Burdon Sanderson, it is concluded with great confidence, that the contagium of cow-pox and sheep-pox is *particulate*; not soluble or diffusible. Our author at once extends this conclusion, by inferential analogy, to *all contagia*. It certainly explains, with great convenience, several well-known facts; especially the escape of some persons, and the suffering of others, exposed to infection at the same time and place. The number of particles, like the number of bullets upon a battle-field, will determine the respective chances of "being hit."

*Facts of infection* are twofold: those presented by the contagion within, and those which it presents without the body. Within the body, the most noteworthy is its enormous capacity of reproduction. Dr. Mac-lagan asserts that no physical or chemical process, except organic reproduction, affords a semblance to this. But *combustion* does resemble it, so far as it is (in a progressive conflagration for example) the extension of the same kind of change from one mass of substance to another, with the production of the same material result or resultants. All through the book before us, we are reminded of the very able discourse of the late Dr. Snow, of London, upon "continuous molecular change;" not because of parity of reasoning, but because the idea or theory of Dr. Snow, while venturing less than that of Dr. Mac-lagan, will account for nearly all of his facts, while avoiding some of his most formidable difficulties.

Our author examines with care and candor the views of several leading writers, upon the analogy between the action of contagia and that by which, under certain conditions, crystals are formed, or definite chemical changes are effected; such, for example, as the conversion of oxamide into oxalic acid and ammonia, when oxamide is brought into contact with a solution of oxalic acid. We have not space to recall the considerations which satisfy him that a perfect analogy to contagion is not presented in either of these instances. Nor can we follow in detail his able analysis of the facts and opinions of numerous observers concerning the coincidence of bacteria, microzymes, or micrococci, with infectious diseases of various types. Our readers are, no doubt, already familiar with much written upon this subject by Beale, Sanderson, Hallier, Cohn, Bastian, and others. More nearly than elsewhere in this book, our author approaches the biological discussion, when, in discoursing upon "the nature of contagion" (Chap. II.) he glances at Dr. Bastian's doctrine of "abiogenesis," and the counter evidence, of Tyndall and others, again and again disproving the asserted occurrence of spontaneous generation. As we have stated, it was beyond the purpose of Dr. Mac-lagan's book to notice the later phases of this biological controversy. Our readers' attention may, however, be called, *en passant*, to the very striking experiments made recently by Tyndall (reported in *Nature* a few months since); whereby he established clearly the effect of *interrupted* and *repeated* exposure of liquids containing bacteria to heat, in rendering totally barren of life materials which had remained prolific after a *longer* exposure to a *higher* temperature once only. The explanation here, as Tyndall shows, is, that the *germs* of minute organisms may be not only ultra-microscopic in minuteness, but *more resistant* than the organisms themselves, to the destructive action of heat. By *repeated* short exposures to a high temperature, the successive *broods* of developing germs are killed, so that at last none remain, and the liquid becomes barren. Dr. Mac-lagan accords full weight to the cogent reasons for not making synonymous the terms "bacteria" and "contagia." These are, especially, that 1, bacteria may be introduced

into the circulation of the lower animals without serious effects; 2, bacteria are found in abundance on the mucous and other surfaces of the body in health, and in many fluids which are not morbid; 3, many fluids, known to be virulent, are most potent in the fresh state, and lose their infecting power at a time when bacteria are rapidly developing in them. The third of these well-proven facts, perhaps the most important in its bearing upon our present subject, is ingeniously disposed of by Dr. MacLagan. Accepting fully the judgment that contagia may be non-identical with all, and must be removed in nature at least from some, bacteria, he suggests that the increase in the number of the latter, in fluids which at the same time are losing their infective power, may be due to the contagia undergoing *bacterial degeneration*.

Most characteristic of Dr. MacLagan's book is the hypothesis which he elaborates, in seventeen chapters, upon the *mode of action* of contagion *in the body*. We will endeavour in a few words to indicate the substance of this hypothesis. Taking, first, the eruptive fevers for study, it is observed that, while each of those fevers has its own definite phenomena, certain features are common to the whole group. This last fact must be referred to similarity of causation. All features common to the whole group Dr. MacLagan accounts for by the theory that the contagious particles are minute organisms, requiring for their nutrition and growth *nitrogen and water*; these being obtained at the expense of the *constructive store albumen* of the body. From this robbery of the organs, while retrograde metamorphosis goes on as fast, or faster than usual, results excessive tissue waste, with excess of urea in the blood. But as *water* also is consumed largely by the growing organisms, its deficiency explains the scanty *excretion* of urea by the kidneys. *Calor præter naturam*, the leading phenomenon of fever, is ascribed to the increased tissue-consumption. The rapidity of circulation in fever Dr. MacLagan refers to the increased demand for material in the tissues, at a time when not only they but also the contagium particles, are, so far as can be, to be "fed" and maintained. This explanation seems to us very doubtful.

We may remark that, on this view, it is supposed that tissue-combustion is, during fever, going on so actively as to generate an unusual amount of heat, while at the same time the material normally required to renew the tissues is being taken up by millions of growing organisms. But it is not apparent that lessened formation of tissue will, *per se*, occasion hastened disintegration of tissues already formed. Soon, also, less tissue being constructed, there must be less of it to furnish fuel for waste combustion. We need not dwell here on the generally recognized probability that the chief normal source of heat in the body is material (from food) in the blood, not yet built up into the tissues. No doubt excessive consumption of tissues does occur in fever; and this is attended by increase of temperature. Since, however, the *growth* of the hypothetical organisms cannot be supposed to be a source of heat, we are inclined to the opinion that the essential causative condition here is *lowered vital energy* of the system, allowing oxidation to occur instead of construction of tissues.

Our author does not assert that the *growth* of contagia in the body produces heat, but he does venture the bold proposition that their *fecundation* does. Against the probability of this much might be said; but we may be satisfied with quoting his own declaration (p. 205) that "organisms such as those we are now dealing with multiply by division." Surely multiplication by division of the lowest organisms cannot generate much,

if any, heat. Moreover, *what becomes* of these wonderful fecundating organisms? The life-history assigned to them by our author makes us somewhat impatient with their *ultra-microscopic* character. Also it is especially hard to conceive the regularity and consentaneousness of their myriad introduction and reproduction, as in relapsing fever; and still more, in the quotidian paroxysms of intermittent fever; to which last our author, as we have said, scarcely alludes.

Further, Dr. MacLagan holds that the contagia live, grow, and multiply in the body as *parasites*. Each kind requires a *nidus* for its fecundation, and this nidus is some organ, which yields a *second factor*, whose existence is, to the specific morbid action of the contagium, a *sine qua non*. For diphtheria, the second factor exists in the throat; for typhoid fever, in the intestinal glands; for smallpox, in the skin; for relapsing fever, in the blood at large; etc. etc. The second factor is exhaustible; hence the self-limitation of fevers. That which is essential to many diseases, as the exanthemata, when once exhausted, is never or seldom renewed; hence the immunity of the individual from a second attack. The local lesions peculiar to the different specific fevers are referred to the reaction, in the organs affected, between the second factor and the "fecundating" contagia. All the leading phenomena of fevers are carefully analyzed by our author, and some explanation is afforded for every one, in accordance with the hypothesis above briefly set forth.

To follow Dr. MacLagan throughout this analysis would require a lengthened review. Unquestionably he manifests much ability, research, and acquaintance with the natural history of disease, as well as with current ideas in pathology. But we cannot accept his arguments as demonstrative or satisfactory. Too much is conjectural; too many gaps are left to be filled up. Yet we believe that the thoughtful student of general pathology will be well rewarded for the attentive perusal of the whole volume. It contains a presentation of very many facts of great interest, and reasonings of extreme ingenuity, most lucidly stated; to the merits of which we have in this notice done but scanty justice. H. H.